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Opportunities in Singapore

Trade report for the Ministry of
Foreign Affairs of Republic of Estonia

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REPUBLIC OF ESTONIA
MINISTRY OF FOREIGN AFFAIRS

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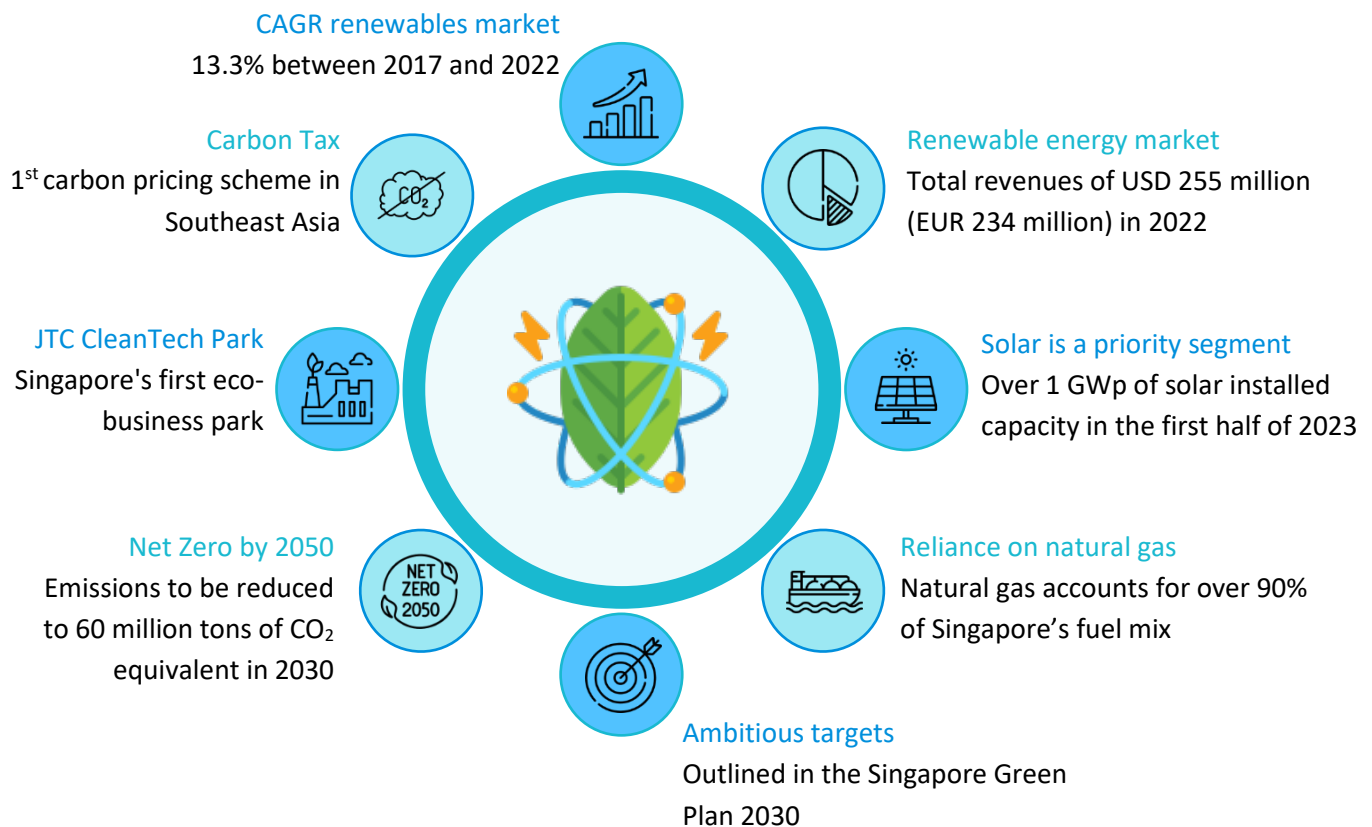
Exchange rates used in the report

USD 1 = EUR 0.91

Focus sector: CleanTech/GreenTech

1. Singapore CleanTech/GreenTech sector overview

Figure 1: Snapshot of the CleanTech/GreenTech market in Singapore



In 2022, Singapore raised its national climate target to achieve net-zero emissions by 2050 as part of its [Long-Term Low-Emissions Development Strategy](#), establishing itself as a technology frontrunner in sustainable solutions.

While Singapore's gross domestic energy consumption is expected to rise, approximately 1 GW of the country's current generation capacity will be retired by 2028 due to ageing infrastructure. Consequently, the country is boosting its installed power generation capacity, with solar energy identified as a priority segment.

The country is strengthening its position as a hub for green funding opportunities with the recent launch of the [Financing Asia's Transition Partnership](#) (FAST-P) initiative. This initiative aims to raise USD 5 billion (EUR 4.6 billion) in collaboration with international partners to accelerate energy transition at scale in Asia. Coordinated by the Monetary Authority of Singapore (MAS), this blended finance initiative will mobilise substantial financial resources to support sustainable projects across Asia.

Singapore is supporting the development of the industry because of its vulnerability to higher temperatures and extreme weather events as a consequence of climate change. These are highlighted in the findings of the [Third National Climate Change Study \(V3\)](#) from the [Centre for Climate Research Singapore \(CCRS\)](#), a dedicated tropical climate research centre in Singapore.

Market trends at a glance

SolarNova and rooftop applications drive the PV market



Singapore is exploring hydrogen for energy production



Investment in EV manufacturing and related infrastructure



Due to its physical constraints, Singapore is prioritising the development of the solar segment as a key clean energy source. The [SolarNova programme](#) is a key government-led initiative driving the deployment of solar photovoltaic (PV) systems across the city-state, aggregating demand from various government agencies. In 2024, EDP Renewables APAC was awarded the Housing and Development Board's (HDB) largest solar leasing tender. As part of this initiative, more than 320,000 solar panels will be installed across 1,075 HDB blocks (public housing provided by the HDB) and 101 government-owned buildings, with a total solar capacity of 130 MWp. Once fully operational, the project will collectively power over 50,000 four-room flats and potentially reduce carbon emissions by at least 96,360 metric tonnes annually. It is anticipated that the installation of the solar panels will be completed by the third quarter of 2026. Rooftop solar technologies are also being implemented as the country aims to maximise the available surface area for solar energy generation. In 2024, it was announced that Changi Airport would be home to Singapore's largest single-site rooftop solar panel system, scheduled for completion in early 2025.

Singapore is exploring hydrogen technologies to increase its renewable energy production while reducing CO₂ emissions. Notably, Singaporean energy producer YTL Power International recently secured the right to construct, own, and operate a new 600 MW hydrogen-ready combined cycle gas turbine at Pulau Seraya Power Station. Similarly, Keppel recently announced plans to build a new hydrogen-ready power plant on Jurong Island, which is expected to be completed in the first quarter of 2026. As part of efforts to strengthen the country's energy resilience, Singapore has also revealed plans to build two open-cycle gas turbine (OCGT) generation units. These units will run on natural gas, with diesel as a backup, and are set to become operational in June 2025, each producing up to 340 MW of electricity. The OCGTs can utilise up to 3% hydrogen and, with the necessary enhancements, could eventually run fully on hydrogen.

Singapore is building the infrastructure required to accelerate the adoption of electric vehicles (EVs) while also attracting EV manufacturing investments. A notable example is Hyundai's recent opening of its high-tech EV factory in Singapore. In 2023, Dyson announced plans to establish a next-generation battery plant in Singapore. The 23,000-square-metre plant is being constructed in the Tuas industrial district in southwest Singapore. Production is set to begin in 2024, with the plant expected to be fully operational in 2025. Meanwhile, Singapore is collaborating with international companies to enhance its EV infrastructure. For instance, towards the end of 2023, Japanese information technology company NTT Data announced that it would provide the Singapore government with a data management and analysis service for EV charging infrastructure, helping to make the country's growing network more efficient.

2. National strategies and policies

Strategies and policies at a glance

Singapore Green
Plan 2030



National Hydrogen
Strategy



Zero Waste
Masterplan



Green Economy
Regulatory Initiative
(GERI)



Important R&D
funding initiatives



Sandbox for Energy
Sector Innovations



2.1. Sector strategies and policies

Singapore is at the forefront of the development of innovative solutions, with the government setting ambitious targets for the sector. A key policy formulated is the [Singapore Green Plan 2030](#), charting targets to advance Singapore's national agenda on sustainable development.

As part of the Singapore Green Plan 2030, the country aims to quadruple its solar energy capacity by 2025, compared to 2021 levels. In addition, Singapore is exploring the import of green energy from the Southeast Asia region and beyond to diversify its energy sources further. Hydrogen will play a complementary role in Singapore's power mix, alongside solar, imported electricity, and other potential low-carbon energy sources, contributing to a more sustainable and resilient energy landscape.

Singapore is investing in water research and development to halve the energy required to produce desalinated water. With floating solar panels on reservoirs, all local waterworks are being powered by solar energy. Additionally, waste treatment facilities, such as Tuas Nexus, have become energy-positive.

The city-state targets to use 15% less energy in public housing estates developed by the HDB by 2030. This will be achieved thanks to measures like the widespread use of smart LED lights and solar energy. Beyond these efforts, Singapore aims to green 80% of all its buildings by the end of the decade.

As part of the plan, Singapore is developing eco-friendly districts as demonstration projects. Jurong Lake District is emerging as a model sustainable mixed-use district, with district cooling, solar power deployment and super low-energy buildings.

Singapore's urban environment makes it an ideal city for adopting EVs. By 2040, Singapore aims to phase out internal combustion engine vehicles and have all vehicles run on cleaner energy. To achieve this, by 2030, all newly registered cars will be cleaner-energy models, a category that in Singapore includes both EVs and hybrid vehicles.

To support the growth of EVs, Singapore will more than double its EV charging points from 28,000 to 60,000 by 2030. This includes working with the private sector to achieve 40,000 charging points in public car parks and 20,000 charging points in private premises.

Other important strategies include:

- In 2022, Singapore released its [National Hydrogen Strategy](#), envisioning hydrogen potentially supplying up to half of the country's power needs by 2050 while also becoming a new source of fuel for the maritime and transport sectors. As the busiest container transshipment port and one of the leading air hubs globally, Singapore aims to position itself as a catalyst for the transition towards greener shipping and aviation.
- Singapore is actively investigating the potential of geothermal energy as part of its clean energy strategy, focusing on advanced deep geothermal systems like the Advanced Geothermal System (AGS) and Enhanced Geothermal System (EGS). Current efforts include a comprehensive geophysical study to assess deep geothermal resource potential and collaborations with academic and industry experts to ensure the feasibility and safety of geothermal energy deployment in the country's densely built environment.
- Under [Singapore's Zero Waste Masterplan](#), the country aims to increase its overall recycling rate to 70% and reduce waste-to-landfill per capita per day to 30% by 2030. Targets are set with plans to extend the lifespan of Singapore's only landfill beyond 2035. Interestingly, Singapore is exploring chemical recycling to complement existing mechanical recycling capabilities.

2.2. Regulatory environment

As Singapore's energy regulator, the Energy Market Authority (EMA) issues [licenses](#) to companies operating in the electricity, gas, and district cooling sectors, including generation companies, importers, retailers, and wholesalers. In general, obtaining a license in Singapore does not permit suppliers to offer their solutions in other Southeast Asian countries, as each country has its own regulatory requirements.

Other regulatory standards that may apply to the CleanTech/GreenTech sectors, depending on project type and tender requirements, include the [Energy Conservation Act](#), the [Environmental Protection and Management Act](#), the [Public Utilities Act](#), and the [Sewerage and Drainage Act](#). It is important for Estonian companies to partner with Singapore-based firms and familiarise themselves with the relevant regulations before entering any projects.

Estonian CleanTech/GreenTech companies providing software solutions must ensure the protection of user data and strictly comply with the [Personal Data Protection Act \(PDPA\)](#), which mandates that businesses obtain user consent before collecting, using, or disclosing personal data.

Estonian companies can also consider the following sandboxes:

- The [Green Economy Regulatory Initiative \(GERI\)](#) targets businesses planning to trial innovative green solutions whose implementation might be constrained by current regulations. GERI facilitates expedited trials of projects in key areas such as carbon services and trading, circular economy solutions (including plastics and e-waste recycling), CO₂ to aggregates, electric vehicles, energy (including solar and smart grid systems), hydrogen technologies, sustainable aviation and maritime initiatives, and sustainable tourism.
- The [Regulatory Sandbox for Energy Sector Innovations](#) offers companies space to test new products and services with temporary regulatory waivers. Companies looking to leverage existing or new technology in an innovative way to provide products and services in the electricity and gas sectors are eligible to apply.

2.3. R&D funding for CleanTech/GreenTech in Singapore

Some important R&D funding initiatives that Estonian companies should be aware of include:

- The [Low-Carbon Energy Research Funding Initiative \(LCER FI\)](#) is a multi-agency initiative aiming to develop low-carbon energy technologies in hydrogen and carbon capture, utilisation, and storage (CCUS) to support the decarbonisation of the power and industry sectors. The first grant call was issued in 2021 and focused on developing low and medium-technology readiness level technologies. Singapore selected 12 research, development and demonstration projects as part of the first call, totalling SGD 55 million (EUR 37.5 million). The second grant call was launched in 2023 for funding from April 2024 onwards. A further SGD 129 million (EUR 88 million) has been allocated for phase two of LCER FI, with a focus on enhancing the viability of low-carbon technologies, especially low-carbon hydrogen. This phase prioritises importing, storing, handling, and utilising hydrogen safely and economically at scale, with R&D efforts exploring ammonia cracking for hydrogen production and improving transport and storage methods.
- The Energy Market Authority (EMA) launches competitive [grant calls](#) to catalyse applied R&D of innovative energy technologies and solutions. Over the last ten years, EMA and its industry partners have jointly awarded over SGD 200 million (EUR 136.5 million) in grants, benefiting more than 80 companies and 40 institutes of higher learning and research institutes. These grants have supported projects in areas such as renewable energy, energy storage, smart grids, and energy efficiency. Notably, EMA recently introduced an Energy Storage Grant call for R&D projects to develop and test innovative energy storage system (ESS) solutions that address the specific challenges of Singapore's tropical climate and urbanised environment, including land constraints, high costs, and safety considerations, which are limiting large-scale deployment.

3. The CleanTech/GreenTech ecosystem

Singapore's CleanTech/GreenTech ecosystem is recognised as one of the most innovative and accessible networks in the region. This ecosystem comprises government agencies, public corporations, venture capital firms, system integrators, universities, and research institutes. Notably, during the course of an interview conducted for this study, Singapore-headquartered venture capital firm focused on decarbonization investments [Tlirec](#) highlighted how the city-state has emerged as a hub for green financing, serving as a launchpad for companies looking to expand into the wider Southeast Asia region.

3.1. Private sector CleanTech/GreenTech players

Below is a list of some developers, integrators, waste operators, and venture capital firms in Singapore.

Table 1: Key private sector CleanTech/GreenTech stakeholders

Organisation name	Type	Profile
Sembcorp Industries Ltd	Urban developer	- Sembcorp Industries is a state-owned energy and utilities provider focusing on a wide range of services, including gas and related services, renewable energy, integrated urban solutions, and decarbonisation solutions. Sembcorp Industries is actively exploring hydrogen as a low-carbon alternative and is developing technologies for its importation, transportation, and storage. https://www.sembcorp.com/
Keppel Ltd	Infrastructure operator	- Singapore's conglomerate Keppel Ltd is a global asset manager and operator with expertise in sustainability-related solutions across infrastructure, real estate, and connectivity. Keppel operates in more than 20 countries worldwide, providing critical infrastructure and services for renewables, clean energy, decarbonisation, sustainable urban renewal, and digital connectivity. https://www.keppel.com/en/
Sobono Energy Pte Ltd (Sobono Group)	Integrator	- Sobono Group, based in Singapore, provides various renewable energy solutions to combat climate change and environmental degradation. Specialising in scalable energy products, the company focuses on distributed and embedded power generation with solutions in biogas, biomass, and waste heat recovery. Sobono Group prioritises energy productivity, security, and responsibility, and is an authorised distributor of MicroTurbine® Generator Systems from Capstone Turbine Corp. https://sobono.com.sg/
Power Technologies Pte Ltd	Integrator	- Power Technologies is a Singapore-based distributor and integrator specialising in energy efficiency and sustainable solutions. The company focuses on predictive energy harvesting and thermal monitoring solutions, utilising industrial IoT, Big Data, and AI. Key partners include Anbesec, Zyggot, and Elmeasure. https://powertechnologies.com.sg/
Greenway Environmental Waste Management Pte Ltd	Waste Operator	- Green Environmental Waste Management is a Singapore waste management operator specialising in waste collection, sewage management, recycling, and disposal services. https://greenwayenv.com.sg/
iGlobe Partners	Venture Capital	- iGlobe Partners is a Singapore-based venture capital firm that has invested in over 100 startups both locally and internationally. Its investment portfolio spans various sectors, including climate change, renewable energy, food and agriculture, materials, and diagnostics. https://www.iglobepartners.com/
GenZero	Venture Capital	- GenZero, a Temasek-owned global investment firm based in Singapore, is an investment platform dedicated to advancing decarbonisation efforts. GenZero focuses on making global investments in three key areas: technology-based solutions, nature-based solutions, and carbon ecosystem enablers. It has also launched the Asia Centre of Carbon Excellence (ACCE) to develop carbon projects in the region. https://genzero.co/

Organisation name	Type	Profile
Trirec	Venture Capital	- Trirec is a Singapore-based cleantech investment holding company focusing on global opportunities in the areas of renewable energy, clean technology and sustainability. It aims to identify suitable equity investment opportunities in early and growth stage companies, which can potentially provide both significant long-term upside return performance while achieving sustainable and positive impact to the environment. https://www.trirec.co/

3.2. Public sector CleanTech/GreenTech players and associations

Below is a list of government agencies, state-owned enterprises, academic and research institutes and industry associations that Team Estonia and Estonian companies can collaborate with. In addition to being facilitators, some of the organisations are also potential buyers of Estonian solutions.

Table 2: Key public sector CleanTech/GreenTech stakeholders and associations

Organisation name	Type	About
Ministry of Sustainability and the Environment (MSE)	Government agency	- MSE is responsible for formulating and implementing policies related to Singapore's environment, water, and food sectors. MSE established the SG Eco Fund in 2020 to support environmental sustainability projects focused on climate change mitigation, waste reduction, and the conservation of nature and biodiversity. MSE's agency, the National Environment Agency (NEA), promotes energy efficiency across the industrial, household, and public sectors and operates the Integrated Waste Management Facility (IWMF). https://www.mse.gov.sg/
Energy Market Authority (EMA)	Government agency	- EMA, a statutory board under the Ministry of Trade and Industry (MTI), ensures a reliable and secure energy supply and promotes competition in the energy market. EMA serves as the Power System Operator (PSO), industry developer, and regulator for Singapore's electricity, gas, and district cooling services. It oversees the Future Energy Fund, set to be established in late 2024, to support infrastructure investments for the local energy transition towards a net-zero future. EMA also offers a regulatory sandbox for companies to test new products and services in a safe space. https://www.ema.gov.sg/
Economic Development Board (EDB)	Government agency	- The Economic Development Board (EDB), a government agency under the Ministry of Trade and Industry (MTI), focuses on investment promotion and industry development. It offers the Resource Efficiency Grant for Emissions (REG(E)) to support manufacturing facilities and data centres in improving energy efficiency. Additionally, EDB collaborates with the Energy Market Authority (EMA) on the Low-Carbon Energy Research Funding Initiative (LCER FI) to explore low-carbon energy technologies, including hydrogen, geothermal energy, and carbon capture, utilisation, and storage (CCUS). https://www.edb.gov.sg/
Enterprise Singapore (ESG)	Government agency	- ESG is MTI's government agency dedicated to fostering enterprise development. It works with companies to enhance capabilities, drive innovation, and expand internationally while also promoting Singapore as a global trading and startup hub. ESG hosts SLINGSHOT, a global deep-tech startup competition. http://www.enterprisesg.gov.sg/

Organisation name	Type	About
JTC Corporation (JTC)	Government agency	- JTC Corporation, an agency under Singapore's MTI, serves as the master planner and developer of the country's industrial infrastructure. It specialises in planning and promoting various industrial landscapes such as fabrication parks, business parks, and logistics hubs. JTC also established CleanTech Park, Singapore's first eco-business park, for its CleanTech Accelerator program, which provides business and research support to local and international cleantech companies. Since 2015, JTC has hosted the annual Innovation Challenge to foster collaboration on innovative solutions for building and estate management. https://www.jtc.gov.sg/
Energy Studies Institute (ESI), National University of Singapore (NUS)	Institute	- NUS is a premier research-intensive institution offering a broad spectrum of courses. In a strategic partnership with Temasek, DBS, and Google, NUS'S Center for Nature-based Climate Solutions has initiated the Sustaintech Xcelerator programme, which aims to identify and support local climate innovators developing natural solutions. Moreover, NUS houses the Energy Studies Institute (ESI) and Solar Energy Research Institute of Singapore (SERIS). https://www.nus.edu.sg/
Energy Research Institute (ERI@N), Nanyang Technological University (NTU)	Institute	- NTU is a premier institution in Singapore specialising in engineering and technology, established the Energy Research Institute @ NTU (ERI@N) to consolidate energy research efforts across the university. ERI@N houses the EcoLabs Centre of Innovation for Energy, an innovation cluster aimed at building and accelerating deep-tech energy capabilities in Singapore. Additionally, NTU partnered with SP Group to create the SP Group-NTU Joint Laboratory, which focuses on energy-related projects. https://www.ntu.edu.sg/index
Singapore Power Ltd (SP Group)	Electricity operator	- SP Group, a state-owned national grid operator, provides transmission, distribution, and market support services to 1.6 million industrial, commercial, and residential customers. The company delivers a wide array of renewable and sustainable energy solutions, including solar energy systems, microgrids, cooling and heating solutions, electric vehicle fast charging infrastructure. https://www.spgroup.com.sg/
Sustainable Energy Association of Singapore (SEAS)	Association	- SEAS is a non-governmental business association representing over 200 companies across various sectors of sustainable energy, including energy efficiency, renewable energy, carbon management, sustainable infrastructure, and sustainable laboratories, as well as banks and funds interested in the sector. SEAS hosts the Singapore Sustainability Academy to provide training and networking opportunities. https://www.seas.org.sg/
Waste Management and Recycling Association of Singapore (WMRAS)	Association	- WMRAS, established in 2001, is the sole non-profit trade association dedicated to solid waste management in Singapore. Its membership spans a broad spectrum of the industry, including waste collection, recycling, recovery, e-waste, hazardous and biohazardous waste, and includes both equipment and service providers. https://www.wmras.org.sg/

3.3. Recent CleanTech/GreenTech-related tenders

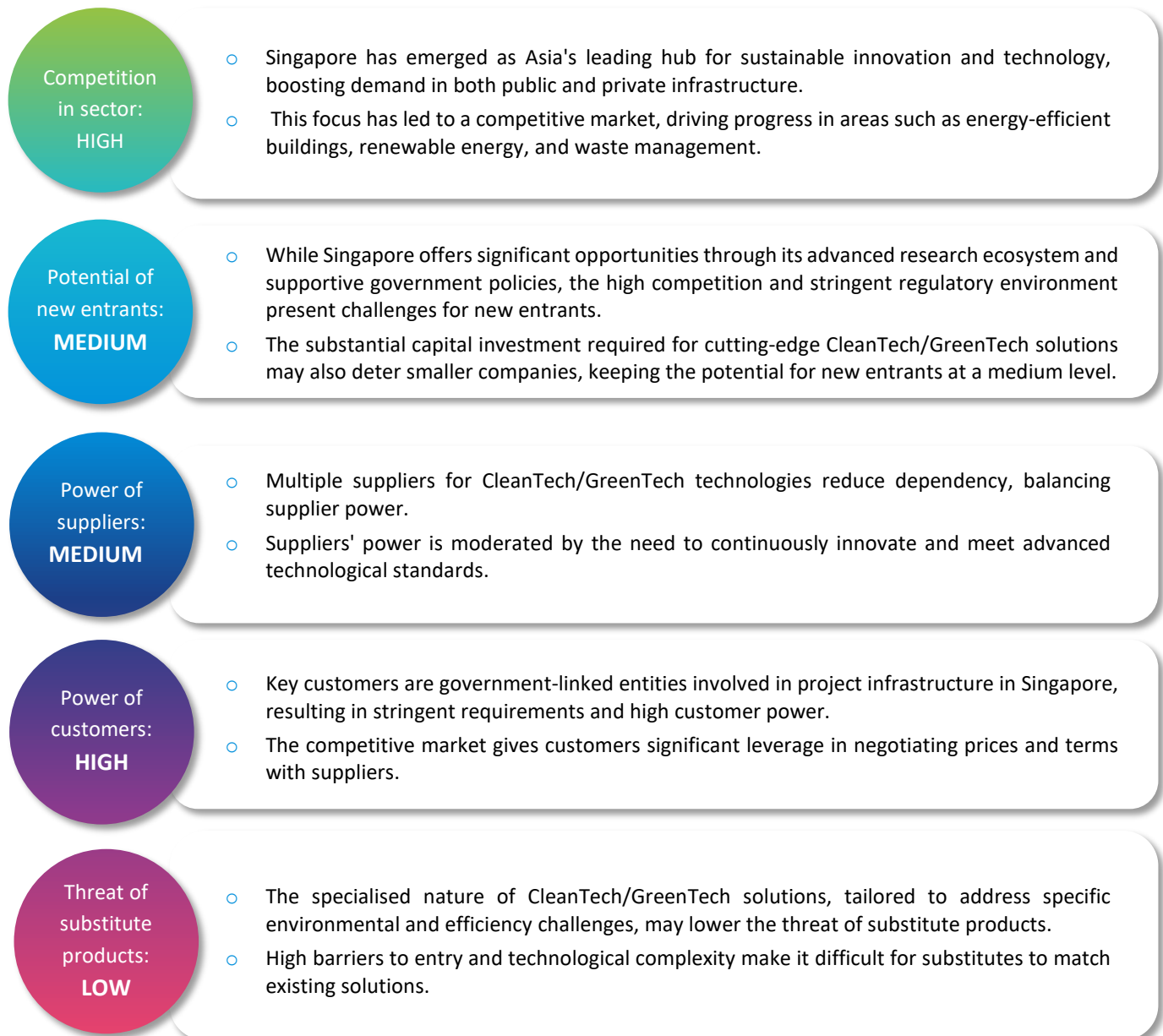
Below are some examples of agencies that have recently issued CleanTech/GreenTech-related tenders.

Table 3: Recent CleanTech/ GreenTech-related tenders

Organisation name	About
JTC Corporation	The tender seeks proposals for the development and implementation of a Real-Time Monitoring and Analytics System designed for managing and optimising in-building water distribution networks.
National Environment Agency	The tender is for comprehensive services to upgrade, service, and maintain the refuse disposal management system at the Tuas South Incineration Plant.
Land Transport Authority	The tender is for supplying and installing a solar PV system for the Jurong Region Line to improve energy efficiency and sustainability.

4. Competitive landscape

4.1. Porter's five forces analysis of Singapore's CleanTech/GreenTech sector



4.2. Competitor analysis

Singapore's CleanTech/GreenTech sector consists of approximately 400 companies, predominantly local firms, with a notable presence of large international corporations. Singapore's reputation as an international CleanTech/GreenTech hub stems from its substantial investments in smart energy infrastructures, attractive business environment, and a global innovation ecosystem.

The sector is driven by a diverse range of players, including innovative startups, established local firms, and multinational corporations. Some companies collaborate closely with leading research institutions, such as the Energy Studies Institute (ESI) and the Solar Energy Research Institute of Singapore (SERIS), to develop cutting-edge

sustainability solutions. Additionally, government-linked entities and industry associations play a crucial role in fostering partnerships and facilitating market access. Together, these players contribute to advancements in areas such as renewable energy, waste management, green hydrogen, battery recycling, energy efficiency software, and energy storage technologies, with a strong emphasis on leveraging IoT and AI.

Key advancements in Singapore's cleantech sector include strategic partnerships between local startups and multinational corporations for regional and global expansion. For instance, [SensorFlow](#), an AI-powered IoT energy management solutions company, has collaborated with Shangri-La Singapore Hotel to implement its Smart Room Energy Management system (SmartREM) in the hospitality sector. Additionally, [Evercomm Singapore](#), an end-to-end energy solutions firm, has teamed up with Mitsubishi Electric Corporation to market their integrated solutions in the manufacturing sector across Asia-Pacific region. Another noteworthy example is [Barghest Building Performance \(BBP\)](#), an energy efficiency technology provider, which has partnered with Grundfos to deliver sustainable cooling digital solution across Southeast Asia. However, there is a notable lack of local innovations in the bio-based alternative materials subsector.

The tables below illustrate examples of companies within the CleanTech/GreenTech sector that could potentially compete with Estonian companies. This is not an exhaustive list, but rather a strategic starting point.

Table 4: Competitor map of the CleanTech/GreenTech sector

Building management	Renewable energy	Energy solutions	Waste management
IoT system   	Solar generation   	Energy efficiency system   	Upcycle & Recycle   
Sensor & Controls   	Smart grid systems  	Energy storage   	Membrane production  

Building management	Renewable energy	Energy solutions	Waste management
Carbon reduction   	Hydrogen production  	Battery recycling   	Water management  
Carbon tracking  	Hydrogen membrane 	EV charging  	Food waste  
			Bio-based materials 

5. Export opportunities

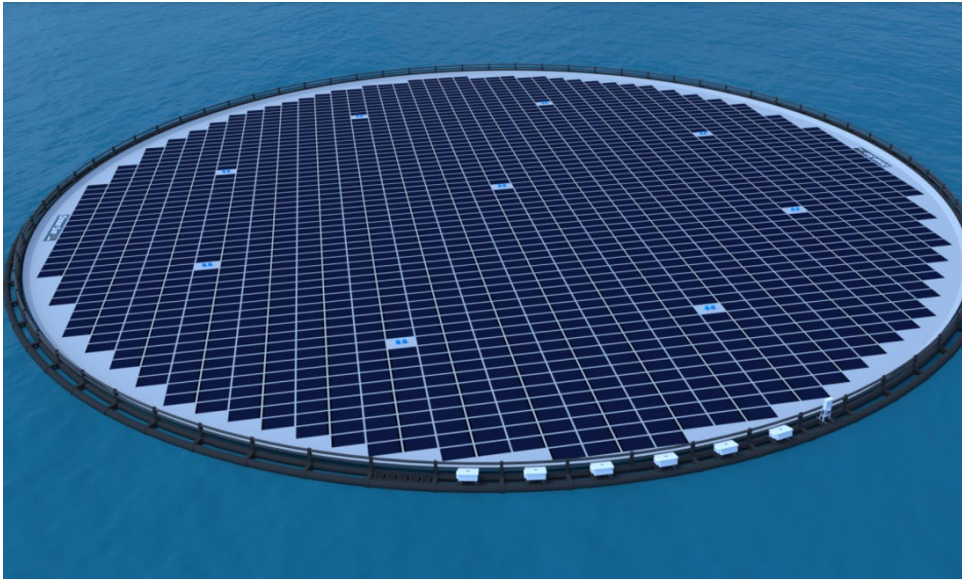
Innovation and the imperative to address climate change are key drivers of Singapore's CleanTech/GreenTech market. Prominent focus areas in energy generation include solar and hydrogen technologies. Simultaneously, the city-state is accelerating the transition to electric vehicles (EVs) and setting ambitious targets for recycling rates.

Case study

Estonian companies should be aware that Singapore is an ideal location for piloting innovative solutions, as demonstrated by the recent collaboration between Norwegian solar firm [Ocean Sun](#) and Singaporean conglomerate Keppel to test a new type of solar panel engineered to withstand rough winds and choppy waters at sea.

The pilot project, which began in 2022, benefits from a USD 6 million (EUR 5.5 million) grant awarded to three projects focused on test-bedding new clean energy solutions. This initiative marks Singapore's first membrane-based nearshore floating solar PV system.

Figure 2: Ocean Sun's membrane-based nearshore floating solar PV system



Source: Ocean Sun

Compared to the conventional floating PV systems used in Singapore in calmer water bodies such as reservoirs, the membrane-based PV system is designed based on floating PV technology to harness solar energy reliably amid stronger waves and rougher sea conditions in a nearshore marine environment. This is achieved by attaching solar panels directly onto large circular reinforced membranes protected by a high-density polyethylene pipe structure surrounding the membrane, which creates a stable and safe platform.

The pilot PV system consists of three circular platforms with an installed capacity of 1.5 MWp. The circular reinforced membranes for the PV panels ensure the lowest material usage of any floating PV system, enabling a lower Levelised Cost of Energy (LCOE) as well as resource conservation.

The project is meant to serve as a model for future scaling and replication in nearshore water bodies in Singapore as well as overseas.

5.1. Key opportunities and gap analysis

The following opportunities stand out when considering Estonia's strengths, Singapore's goals, unmet demands, and emerging trends in the market:

- **Bring innovative PV solutions**, which Singapore is keen to explore. Singapore continues to invest heavily in solar technology to maximise energy output and efficiency. With a strong focus on sustainability and the need to optimise limited land resources, the country is fostering collaborations between local startups, research institutions, and industry leaders to develop next-generation photovoltaic systems. These efforts are part of a broader strategy to enhance the resilience and longevity of the nation's solar infrastructure. For example, in late 2023, researchers from Nanyang Technological University Singapore ([NTU Singapore](#)) and the startup [EtaVolt](#) announced the development of a high-intensity illumination device designed to rejuvenate solar panels and reduce their degradation. Known as Advanced Regeneration Technology, this technique involves applying intense light and controlled temperature to the solar cells, exciting the polysilicon molecules and causing them to move rapidly. This reorganisation effectively 'patches up' damage caused by light, heat, and humidity. The research team claims that this process could extend the lifespan of solar modules by up to five years.

- **Offer hydrogen technologies with applications for Singapore's maritime industry.** The government's commitment to reducing carbon emissions in the shipping sector has created a favourable environment for the adoption of alternative fuels. For instance, in December 2023, [Vinssen](#), a South Korean producer of electric and hydrogen hybrid propulsion systems, successfully delivered a hydrogen fuel cell system for a trial project to test hydrogen as a marine fuel in Singapore. Vinssen had [signed a contract](#) with Shell in 2022 to supply the hydrogen fuel cell for this initiative. The project centres on the Penguin Tenacity, a 184-foot Roll-on/Roll-off (RoRo) vessel, which will operate using the hydrogen fuel cell system in Singapore for a year, starting in 2024. The project aims to convert operational data into real-time insights, verifying the stability and performance of the hydrogen fuel cell system. Vinssen plans to deploy a dedicated team to the Singapore shipyard to install, integrate, and inspect the hydrogen fuel cell system.
- **Explore the potential for hydrogen solutions across various sectors in Singapore,** as the market is ripe for innovation beyond maritime applications. With growing interest in hydrogen technologies, there are opportunities to contribute to developments in aviation, automotive, and other industries. For instance, Airbus and Changi Airport Group, together with other partners, have signed a [cooperation agreement](#) to explore the development of a hydrogen aviation hub in Singapore. This initiative presents a promising opportunity for Estonian companies with expertise in hydrogen technologies. According to the agreement, Singapore's airport could consume 50 tonnes of liquid hydrogen per day starting in 2040, potentially increasing to 600 tonnes per day by 2050. Similarly, the automotive sector is witnessing progress in hydrogen technology. Hyundai, in partnership with Singaporean logistics company PTCL, is establishing [hydrogen mobility infrastructure](#) in Singapore. The South Korean carmaker has also joined a project to build a [research centre](#) for future mobility solutions in Singapore, involving the Singaporean government, a national university, and the Hyundai Motor Group Innovation Centre in Singapore.
- **Singapore is looking for new solutions to enhance its electric grid.** Estonian companies should be aware that Singapore is focused on upgrading its electrical grid to support its transition to more environmentally friendly energy sources and to meet the growing demand driven by economic expansion, digitalisation, and the increasing adoption of EVs. This effort includes exploring the feasibility of increasing transmission voltage levels from power generation plants and enhancing overall efficiency. EMA also aims to expand the reach of the low-voltage electricity network, which traditionally serves households and small businesses. Much of the existing grid infrastructure was constructed between the 1980s and early 2000s, making it essential to reassess the grid's design and plan to accommodate evolving energy needs.
- **Recycling technologies for batteries are an interesting emerging area of opportunity.** For instance, Estonian companies should take note that in late October 2023, Singapore E-waste and battery recycling company KGS officially launched its new battery recycling plant, the third of its kind in Singapore. The first two were opened by battery recycling firms TES Singapore and Se-cure Waste Management. The new plant, covering an area of 20,000 square feet, is expected to boost battery recycling capacity by around 2,600 tons per year, a 30% increase from the existing capacity of 8,600 tons. This expansion supports Singapore's goal of reducing landfill waste by 30% by 2030.
- **Opportunity for Estonian Companies in Singapore's Expanding Energy Storage Market.** Singapore's shift towards a low-carbon energy system and the electrification of its transport network present a significant opportunity for Estonian companies in the energy storage sector. As Singapore looks to enhance the resilience of its electricity grid, there is a growing demand for advanced energy storage systems (ESS) that are safer, denser, and more cost-effective. Notably, in Q4 2023, EMA issued a [grant call for proposals](#) to facilitate the

wider deployment of ESS in Singapore, highlighting the government's commitment to supporting innovative solutions. With the ACCESS programme also streamlining ESS deployment, Estonian firms specialising in cutting-edge storage technologies and efficient urban deployment strategies are well-positioned to enter this market and contribute to Singapore's sustainable energy future. Recycling technologies for batteries are also emerging as a crucial component of Singapore's energy storage ecosystem. The recent expansion of battery recycling capacity by companies like KGS highlights the growing demand for sustainable solutions.

- **Partnering with Singaporean universities is a further avenue to consider.** As Singapore continues to position itself as a global leader in sustainability and clean energy, collaboration with local research institutions and universities can provide valuable opportunities for innovation and growth. Notably, Singapore is at the forefront of global carbon dioxide removal (CDR) initiatives. Singapore's [National Water Agency PUB](#), in collaboration with the [University of California \(UCLA\)](#) and the [startup Equatic](#), is developing a USD 20 million (EUR 18 million) CO₂ removal demonstration plant. This project follows the successful launch of pilot plants in Los Angeles and Singapore in 2023. Set to be completed by 2025 at PUB's R&D facility in Tuas, the plant aims to remove ten metric tonnes of CO₂ per day from seawater and the atmosphere, while also producing nearly 300 kg of carbon-negative hydrogen daily.

5.2. Five-year roadmap

A 5-year plan will enable Estonian companies to build and maintain a robust presence in Singapore's CleanTech/GreenTech sector.

Table 5: A 5-year roadmap for Estonian companies for the CleanTech/GreenTech sector

Understand the market				Enter the market				Growth and Expansion
Year 1				Year 2				Years 3 to 5
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Engage with Team Estonia								
Gather initial market information								
Engage a consultant to help establish connections with local partners and to understand the market better								
Visit the market to attend a CleanTech/GreenTech event and meet potential partners								
Localise the product								
Obtain certifications								
Develop market entry materials								
Participate in a CleanTech/GreenTech trade event								
Engage with stakeholders								
Finalise strategic partnerships								
Regular visits to the market								
Undertake lead-generation activities								
Optimise entry strategies								
Expand into the region								

Year 1: Understand the market

- **Engage with the Estonian Embassy:** Contact the embassy in Singapore to obtain recommendations on strategic targets and assistance in facilitating introductions and explore potential collaborations to extend your market reach.
- **Initial engagement to gather market information:** Engage with these entities and others identified in [Section 3](#) of this report, such as the Sustainable Energy Association of Singapore (SEAS), to gather initial feedback on your offerings, validate your route to market, and understand customer expectations within the CleanTech/GreenTech landscape in Singapore.
- **Engage a consultant:** CleanTech/GreenTech companies should seek guidance from local consultants who can assist with business matching services by identifying relevant local partners, distributors, and key stakeholders in the sector. In addition to [Orissa International](#) and [Intralink](#), market-entry consultants with offices in Singapore and neighbouring counties, include [YCP Solidiance](#), [Dezan Shira](#), [Altios](#), [Tractus](#), [Double M](#) and [Asia Market Entry](#).

These consultants can facilitate introductions to potential collaborators, ensuring that Estonian companies connect with the right partners to accelerate market entry. Additionally, consultants can offer insights into regulatory compliance and advise on obtaining necessary accreditations with agencies like the EMA and the Building and Construction Authority (BCA). They can help identify the necessary certifications such as the Green Mark certification for buildings and explore available grants or incentives, such as the Energy Efficiency Fund (E2F) or the Low-Carbon Energy Research Funding Initiative (LCER FI), to facilitate smoother market entry and build credibility.

- **Attend/participate in a CleanTech/GreenTech event in Singapore:** CleanTech/GreenTech companies can work with consultants to arrange meetings with potential partners at key industry events. Participating in events like the Singapore International Energy Week (SIEW), the largest trade show for the sector in Singapore, offers a prime opportunity to gain visibility, establish valuable connections, and gather real-time insights into the local market. Consultants can facilitate introductions to relevant stakeholders, helping companies maximise networking opportunities with industry specialists. Another notable event is the Clean Enviro-Summit Singapore (CESG).

Table 6: Key CleanTech/GreenTech trade events in Singapore

Event name	Date	About
Singapore International Energy Week (SIEW)	22 – 24 October 2024	○ This is an annual platform for energy professionals to share best practices and solutions within the global energy space. SIEW is organised by EMA. Its partner events, the Asia Clean Energy Summit, Asian Downstream Summit & Asian Refining Technology Conference, Asia Hydrogen & LNG Markets Conference and Future of the Grid, focus on industry-specific topics. ○ 24,000 onsite and online participants from more than 80 countries ○ https://www.edtechasia.com/ https://www.siew.gov.sg/
Clean Enviro-Summit Singapore (CESG)	(2026 dates to be confirmed)	○ Organised by Singapore’s National Environment Agency, this is a biennial global platform for thought leaders, industry captains and policymakers to connect and consider solutions for enabling a sustainable and clean environment. The Summit will feature high-level plenaries, conferences, and an exhibition of cutting-edge environmental technologies and services.

Event name	Date	About
		- Over 20,000 global participants https://www.cleanenviros Summit.gov.sg/

Year 2: Enter the market

- **Localise products:** Continue your collaboration with local experts aligning your CleanTech/GreenTech solutions with Singapore’s specific environmental regulations, sustainability goals, and the unique challenges of its highly built-up, tropical urban environment. Ensure your technologies are fully compatible with local standards and regulations. Offering customisation options that align with Singapore’s specific sustainability goals and regulatory requirements will help build trust and enhance the adoption of your solutions in the Singapore market.
- **Obtain certifications:** Actively pursue relevant certifications and regulatory approvals necessary for operating in Singapore’s CleanTech/GreenTech sector, such as compliance with [energy efficiency standards](#). Stay informed on regulatory changes related to renewable energy, waste management, and carbon emissions to ensure your products are compliant and can penetrate the market effectively.
- **Develop market entry materials:** Create market entry materials that showcase the environmental and economic benefits of your CleanTech/GreenTech solutions. Highlight your technology's ability to address Singapore's unique sustainability challenges, such as reducing carbon emissions or improving energy efficiency. Include case studies from similar urban environments to demonstrate your expertise and success. Offering pilot programs or demonstrations can also help illustrate the effectiveness of your solutions in real-world scenarios.
- **Engage with stakeholders:** Undertake face-to-face meetings and product demonstrations in Singapore to connect with influential players in the CleanTech/GreenTech sector. Participate in sector-specific events and network with key industry associations like Sustainable Energy Association of Singapore (SEAS) to explore collaboration opportunities. Tailor your product demonstrations to address Singapore's unique challenges, such as urban heat management or water conservation, showcasing how your product can solve these issues. Incorporating features that reflect your understanding of the local context will enhance relevance and impact. It is notable that companies like Sembcorp and Keppel have established several “Living Labs” across Singapore to showcase and test new technologies in a real-world environment.
- **Finalise strategic partnerships:** Finalise strategic partnerships by collaborating with local CleanTech/GreenTech companies who can help distribute your solutions and provide necessary customer support. Focus on ensuring your products are well-integrated into Singapore’s sustainability initiatives and smart city projects, ultimately leading to a better user experience and greater market success.

Year 3 and beyond: Growth and expansion of the business

- **Undertake ongoing promotion for lead generation:** Continuously promote your CleanTech/GreenTech solutions through targeted digital marketing campaigns and participation in industry-specific events like the Singapore International Energy Week (SIEW) and CleanEnviro Summit Singapore. Leverage online platforms like LinkedIn, industry-specific portals, and sustainability forums that cater to professionals in the environmental and energy sectors. Develop case studies and offer webinars or online demos showcasing the environmental and economic benefits of your products and services to generate qualified leads and maintain a strong market presence.

- **In-market visits:** Estonian companies must commit to regular visits to Singapore to maintain momentum and build strong local relationships. Recurring market visits allow companies to engage in face-to-face meetings, participate in key industry events, and stay updated on market trends. This continuous presence is crucial for nurturing partnerships, gathering market insights, and demonstrating long-term commitment to the Singaporean market, which is essential for gaining trust and securing successful collaborations in the competitive CleanTech/GreenTech sector.
- **Optimise market entry strategies:** Regularly review feedback from Singapore CleanTech/GreenTech stakeholders and analyse performance metrics to refine your market entry strategies. Focus on enhancing product features that address evolving needs, such as energy efficiency, waste reduction, or renewable energy integration. Adjust your pricing models to reflect the competitive landscape in Singapore, and consider expanding your customer support to include specialised services like environmental consulting, implementation support, and after-sales service to meet the demands of your clients better.
- **Expand into the region:** Leverage your experience in Singapore to penetrate other Southeast Asian CleanTech/GreenTech markets by adapting your solutions to local regulatory requirements, environmental goals, and sustainability standards. Build on your existing partnerships with Singapore energy companies, sustainability consultants, or government agencies to enter neighbouring markets, such as Malaysia and Indonesia. Replicate successful go-to-market strategies from Singapore, such as customised sustainability solutions or collaborative innovation projects, to accelerate your growth across the region.

5.3. Final recommendations

Singapore is an attractive market for clean energy solutions and one of the most advanced in Asia. Estonian companies should anticipate strong competition and focus on their most innovative or specialised offerings to stand out among the numerous existing providers, as demonstrated by the success of Ocean Sun.

For solutions that require complex support, Estonian companies are advised to engage a reseller or distributor in Singapore. This approach allows local partners to manage onboarding, data migration, and other technical services, ensuring a customised experience that meets the specific needs of the market. Additionally, partnering with a local entity provides immediate access to an established marketing network and valuable insights into the regulatory landscape. Many resellers and distributors in Singapore also operate in neighbouring countries, offering expanded regional distribution and sales opportunities.

Singapore is keen to learn about the innovative clean energy solutions developed in Estonia. Estonian companies should invest time in demonstrating how their technologies have been successfully applied domestically and the specific challenges they have addressed. These technologies should then be adapted to suit Singapore's tropical climate.

A strong and clear value proposition is crucial for Estonian companies aiming to secure meetings and generate interest from key agencies and local partners in Singapore. To compete effectively, they must present quantifiable results, such as energy savings, implementation timeframes, and cost reductions. Additionally, third-party or international certifications that validate improvements in energy efficiency can significantly enhance credibility and build market trust.

Significant government support is available for the clean energy sector in Singapore, including grants for R&D, renewable energy system installations, and energy efficiency initiatives. Estonian companies should be aware that

these grants typically require entities to have at least 30% local ownership. As a result, companies wishing to access these funds must either establish a presence in Singapore or collaborate with local partners.

When partnering with research agencies in Singapore, Estonian companies should have clear objectives and ensure alignment with their partners' goals. Clearly defining the project's scope is essential for successful collaboration. Potential partners include Singapore's leading organisations, such as A*STAR, the Public Utilities Board (PUB), JTC Corporation, the Housing and Development Board (HDB), and local universities.